Illinois
Environmental
Protection Agency

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Appendix D to LPC-PA2

INSTRUCTIONS FOR CHEMICAL AND PUTRESCIBLE WASTE LANDFILL DESIGN FEATURES

This Appendix sets out the type of information needed in addition to the general information requested in the LPC-PA2 Instructions. You should review Appendices A-G and Section VI of LPC PA2 form to determine which are applicable to your facility. This Appendix explains how to document the detailed design features of all components of the site.

I. Design & Design Period

Provide the design period for all waste disposal units pursuant to 35 IAC 811.303. Also, if the unit is being designed as a chemical waste landfill (i.e. a facility which accepts only chemical waste), analyses must be provided demonstrating that all wastes to be disposed at the landfill meet the definition of chemical wastes. These analyses must further show that all wastes entering the unit shall be compatible and will not react to form a hazardous substance or gaseous products.

II. Foundation and Mass Stability Analysis and Design

A. Provide a foundation study and analysis performed by or under the supervision of a Registered Professional Engineer showing that the unit demonstrates compliance with 35 IAC 811.304 and 811.305.

B. Provide the following information in connection with the foundation study and analysis:

1. Results of tests performed on foundation materials and include the justification for the appropriateness of the test;

2. Estimated depth of settlement or swell of the foundation of the unit;

3. Diagrams and cross sections of any proposed sub-base or foundation construction;

4. Specifications for the soil to be used for the foundation construction shall include, but not to be limited to, soil classification, permeability, moisture content, moisture-density relationship, plasticity, and strength; and

5. Discuss how the construction quality assurance program will be implemented for the foundation pursuant to 35 IAC 811.Subpart E. (Refer to Appendix E.)

III. Design of Liner System

A. Demonstrate the minimum requirements of 35 IAC 811.306 for compacted clay liners are met by providing the following information:

1. Cross sections and plan views of the liner system;

2. Results of any field or laboratory tests demonstrating that the liner material complies with 35 IAC 811.306(d).

3. A description of the test liner, including:

   a. Diagrams and any supporting documentation showing that the test liner will be constructed and evaluated in accordance with 35 IAC 811.507(a); or

   b. A detailed description of the results of the test liner constructed in accordance with 35 IAC 811.507(a), if constructed prior to permit application;

(Note: A test liner constructed after initial permitting may require a permit modification to incorporate construction quality assurance requirements).

4. A description of construction methods and equipment to be utilized;

5. Side slope stability calculations;

6. A demonstration that the liner has been designed such that it shall remain functional throughout the design period; and

7. Discuss how the construction quality assurance plan will be implemented pursuant to 35 IAC 811, Subpart E. (Refer to Appendix E.)

B. To use geomembranes, the application must demonstrate compliance with 35 IAC 811.306(e) by providing the following minimum information:

1. A description of the physical properties of the geomembrane;

2. Documentation showing that the design of the geomembrane meets the minimum requirements of 35 IAC 811.306(e).

3. A description of the methods to seam the geomembrane in the field in compliance with 35 IAC 811.306(e)(5).

   a. A plan showing the proposed layout of the individual panels and the locations of all openings through the geomembrane;

   b. A cross section and description of how opening in the geomembrane will be constructed to minimize leaks; and

   c. Discuss the construction quality assurance program pursuant to 35 IAC 811, Subpart E for proper construction, seaming and inspection of the geomembrane. (Refer to Appendix E.)

C. For Slurry Trenches and Cutoff Walls provide the following information:

1. A description of the slurry trench or cutoff wall, including documentation of cross sections, material specifications and methods of construction to demonstrate compliance with 35 IAC 811.306(f). Also provide a short narrative describing how the following tests will be accomplished:

Note: All tests shall be performed in accordance with appropriate ASTM, API, Corps of Engrs., or equivalent methods.

a. Laboratory testing of slurry wall material prior to the placement of each 300 linear feet of slurry wall for the following:

   i. Bentonite

      - Swelling index
      - Layer permeability
      - Colloidal yield
      - Cation exchange capacity

   ii. Bentonite/Soil Mixture, with site water

      - Grain size analysis of aggregate
      - Bentonite content
      - Hydraulic conductivity
      - Wet density test

b. Testing the bentonite slurry proposed for use mixed under field conditions with site water for the following:

   i. Bentonite slurry

      - Bentonite content
      - Apparent viscosity, plastic viscosity and yield
      - Density
      - Gel strength and ten minute strength
      - pH
      - Filtration loss
      - Filter cake - thickness and visual description of filter cake strength
      - Sand content

   ii. Water - free of oil and organic matter (weekly test)

      - pH
      - Chloride

- Specific Conductance
- Alkalinity/Hardness
- Volatile Organic Compounds

c. Testing of backfill material each 300 linear feet of cut-off wall for the following.

- Mixing Process
- Grain size analysis
- Slump

d. Testing procedure and frequency to determine the backfill material has achieved a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec.

e. Show that a minimum of three feet of slurry head shall be maintained in the excavation above the maximum anticipated groundwater level and the slurry head should not fall one foot below the ground surface elevation.

2. Location and description of the boreholes, including the results of any testing; and

3. Discuss the construction quality assurance plan, pursuant to 35 IAC 811, Subpart E. (Refer to Appendix E.)

D. For Alternative Liner Technology provide the following information:

Provide a complete description of the technology, including documentation demonstrating that the technology will perform as required by 35 IAC 811.306(g).

IV. Leachate Control System

A. Provide documentation for the leachate drainage and collection system to show how it will comply with 35 IAC 811.307 and 811.308. All applications to develop putrescible and chemical waste landfills must include a leachate drainage and collection system plan.

1. A plan view of the leachate collection system showing: piping locations, leachate level monitoring locations, cleanouts, manholes, sumps, leachate storage structures and other related information.

2. Cross sections of manholes, sumps, cleanouts, connections and other appurtenances.

3. A description of the design including all calculations, assumptions and information which were used in the design. A stability analysis should be included which demonstrates that the side slopes will maintain the necessary static and seismic safety factors during all phases of operation.

4. A maintenance plan which describes the methods used to clean and maintain the system.

5. A discussion of how the construction quality assurance program will be implemented. (Refer to Appendix E.)

B. Leachate Management System

Every landfill which is required to have a leachate drainage/collection system must also submit a leachate management plan for the disposal of collected leachate. The leachate management system may consist of any combination of storage, treatment, pretreatment and disposal options which satisfy the requirements of 35 IAC 811.309. The following should be included:

1. A description of the management system which should include any required documentation such as:

    a. The approved NPDES permit or, if the permit is pending, a copy of the NPDES permit application;

    b. Documentation to demonstrate that the off-site treatment works meets the requirements of 35 IAC 811.309(e)(1); or

    c. Pretreatment authorization, if necessary from the off-site publicly owned treatment works pursuant to 35 IAC 310.

    d. Requests for authorization to recycle leachate must include the following:

        i. A demonstration that the unit satisfies the criteria of 35 IAC 811.309(f)(1);

        ii. Estimates of the expected volume of excess leachate, as defined in 35 IAC 811.309(f)(3);

        iii. A plan for the disposal of excess leachate, as defined in 35 IAC 811.309(f)(3);

        iv. Layout and design of the leachate distribution system; and

        v. Pursuant to 35 IAC 811.309(f)(6), a demonstration that the daily and intermediate cover is permeable, or a plan to remove daily and intermediate cover prior to additional waste disposal.

    e. Design of tanks, lagoons, and all other treatment or storage units;

    f. A map showing the location of all units, piping and monitoring stations; and

    g. A description of the leachate monitoring system, the location of the sampling points, including all parameters to be monitored and the frequency of monitoring. Note: 35 IAC 811.309(g) mandates the minimum initial monitoring frequency and testing for certain parameters.

V. Landfill Gas System

A. For putrescible facilities, provide documentation for the landfill gas monitoring system to show how it will comply with 35 IAC 811.310 and include the following:

All putrescible waste disposal facilities must have a gas monitoring system to monitor the buildup and composition of landfill gas.

1. A narrative and plan sheets describing the most likely paths of migration for gas generated by the unit and demonstrating that the proposed gas monitoring program will detect any gas buildup

and/or migration. A predictive gas flow model may be used as part of this description and demonstration -- 812.309(a) and 811.310(b)(1), (2) and (3).

2. Detail drawings and material specifications of the four types of gas monitoring devices required (i.e., devices within the waste unit, below ground devices around the unit, air ambient monitoring devices and continuous air monitoring devices within buildings) on site or near the facility if there is an indication of gas.

3. A map showing the locations of the below ground monitoring devices and the continuous air monitoring devices.

4. Documentation that the below ground gas monitoring devices satisfy the following requirements:

    a. Gas monitoring devices shall be placed at intervals and elevations within the waste to provide a representative sampling of the composition and buildup of gases within the unit.

    b. Gas monitoring devices shall be placed around the unit at locations and elevations capable of detecting migrating gas from the ground surface to the lowest elevation of the liner system or the top elevation of the groundwater, whichever is higher.

    c. Gas monitoring devices shall be constructed from materials that will not react with or be corroded by the landfill gas.

    d. Gas monitoring devices shall be designed and constructed to measure pressure and allow collection of a representative sample of gas.

    e. Gas monitoring devices shall be constructed and maintained to minimize gas leakage.

    f. The gas monitoring system shall not interfere with the operation of the liner, leachate collection system or delay the construction of the final cover system.

5. A description of the procedures and prerequisite weather conditions for performing ambient air monitoring including the location standards for placement of the monitoring devices and maximum wind speed.

6. A description (narrative or graphic) of the location of the continuous air monitoring devices inside the buildings within the facility (and nearby buildings if applicable).

7. A schedule specifying the frequency and minimum duration of gas monitoring.

8. Identification of the parameters that each type of monitoring device will be testing.

9. For applications that do not propose a gas collection system, the criteria that will be used to determine when a landfill gas management system must be installed.

B. Landfill Gas Collection System

Landfill gas collection systems are optional for putrescible waste landfills except for those which have experienced problems with gas migration or odors and those which recycle leachate (see 35 IAC 811.311). Permit applications which propose landfill gas collection systems must include the following information:

1. A map and detail drawings showing the location of the collection points and the layout and design of the collection system;

2. A description of and specifications for all machinery, compressors, flares, piping and appurtenances necessary to the system;

3. Documentation or assurance that the gas collection system meets the following standards:

    a. The system is designed and will be operated such that the limits described in 35 IAC 811.311(a)(1), (a)(2) and (a)(3) will not be exceeded;

    b. The gas collection system shall transport gas to a central point or points for processing for beneficial uses or disposal in accordance with the requirements of 35 IAC 811.312;

    c. The gas collection system has been designed to function for the entire design period;

    d. All materials and equipment used in construction of the system have been rated by the manufacturer as safe for use in hazardous or explosive environments and shall be resistant to corrosion by constituents of the landfill gas;

    e. The gas collection system has been designed to withstand all landfill operating conditions, including settlement;

    f. Provisions have been made for collecting and draining gas condensate to a management system meeting the requirements of 35 IAC 811.309;

    g. The gas collection system shall not compromise the integrity of the liner, leachate collection or cover systems; and

    h. The gas collection system shall be equipped with a mechanical device, such as a compressor, capable of withdrawing gas, or has been designed so that a mechanical device can be easily installed;

4. A description of the criteria that will be used to determine when operation of the gas collection system shall be discontinued;

5. A description of the testing procedures that will be used to assure that the lines from the collection points to the gas processing or disposal facility are air tight; and

6. A plan for disposal of the condensate.

C. Landfill Gas Disposal or Processing System

All permit applications which propose a gas collection system must also propose a gas disposal system. The gas disposal system can be either an on-site or an off-site facility.

1. For on-site facilities (either flare systems or facilities which process the gas for beneficial use) the following information must be provided:

    a. A map showing the location of the facility;

b. Engineered drawings showing the layout and details of landfill gas processing and disposal system, including compressors, blowers, raw gas monitoring systems, devices used to control the flow of gas from the unit, flares, gas treatment devices, air pollution control devices and monitoring equipment;

c. A copy of the approved air discharge permit or, if the permit is pending, a copy of the air discharge permit application required pursuant to 35 IAC 200 thru 245; and

d. A list of the parameters and constituents for which the gas shall be monitored.

2. For off-site processing the facilities the following information must be provided:

a. A list of the parameters and constituents for which the gas shall be monitored;

b. A description of the means by which the gas shall be conveyed from the landfill to the off-site processing facility; and

c. Documentation that the off-site processing facility meets the following requirements:

i. The solid waste disposal facility will contribute less than 50 percent of the total volume of gas accepted by the gas processing facility. (Otherwise, the processing facility must be considered a part of the solid waste management facility.) and

ii. The gas processing facility is sized to handle the expected volume of gas.

D. Construction Quality Assurance Program

The landfill gas monitoring system (and the collection and disposal/processing systems, if proposed) must be constructed in accordance with a construction quality assurance program. Accordingly, the permit application must include a sampling program based upon statistical sampling techniques and establishing criteria for acceptance or rejection of materials and construction operations.

VI. Surface Water Control

Describe how the landfill design controls surface water and demonstrates the following:

A. Runoff From Disturbed Areas

1. Runoff from disturbed areas resulting from precipitation events less than or equal to the 25-year, 24-hour precipitation event that is discharged to waters of the State will meet the requirements of 35 IAC 304.

2. All discharges of runoff from disturbed areas to waters of the State shall be permitted by the Agency in accordance with 35 IAC 309.

3. The design of discharge structures are such that flow velocities will not cause erosion and scouring of the natural or constructed lining, i.e. the bottom and sides of the receiving stream channel.

4. All drainage ways and swales are designed to safely pass the runoff from the 100-year, 24-hour precipitation event without scouring or erosion.

B. Diversion of Runoff From Undisturbed Areas

1. Runoff from undisturbed areas shall be diverted around disturbed areas unless it is impractical based on site-specific conditions.

2. Diversion facilities shall be designed to prevent runoff from the 25-year, 24-hour precipitation event from entering disturbed areas.

3. Runoff from undisturbed areas which becomes commingled with runoff from disturbed areas shall be handled as runoff from disturbed areas and treated accordingly.

4. All diversion structures shall be designed to have flow velocities that will not cause erosion and scouring of the natural or constructed lining, i.e., the bottom and sides, of the diversion channel and downstream channels.

5. All diversion structures shall be operated until the final cover is placed and erosion stability is provided by the vegetative or other cover meeting the requirements of 35 IAC 811.205 or 811.322.

C. Information on the location and construction schedule must be provided as follows:

1. Provide a map(s) with a scale of 1" = 200 feet showing the location of all surface water control structures. Indicate both disturbed and undisturbed areas and water sheds.

2. Provide detailed designs of all structures to be constructed during development of the facility and during the first five year operating period; and

3. Provide the estimated construction dates of all structures to be constructed beyond the first five year operating period.

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